THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY,

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Dissertation on

"EVALUATION OF CT FINDINGS IN CHILDHOOD SEIZURES"

Submitted for M.D Degree Examination

BRANCH – VII

(PAEDIATRICS)

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CERTIFICATE

This to certify that the Dissertation entitled **"EVALUATION OF CT FINDINGS IN CHILDHOOD SEIZURES"** is a bonafide record of work done by Dr.G.PRAVIN GAVASKAR in the department of Paediatrics, Thanjavur Medical College, Thanjavur, during his Post Graduate Course from 2008 to 2011. This is submitted as partial fulfillment for the requirement of **M.D.,** Degree examinations – Branch –VII (Paediatrics) to be held in April 2011.

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DECLARATION

I, Dr. PRAVIN GAVASKAR, solemnly declare that the dissertation titled **"EVALUATION OF CT FINDINGS IN CHILDHOOD SEIZURES"** is a bonafide work done by me in Raja Mirasudhar Hospital, Thanjavur Medical College, Thanjavur, during March 2010 – August 2010 under the guidance and supervision of Professor **Dr.R.R.RAJENDRAN,M.D.,DCH.**

This dissertation is submitted to **"The Tamilnadu Dr. M.G.R. Medical University, Chennai",** Tamilnadu as a partial fulfillment for the requirement of **M.D** Degree examinations – Branch –VII (Paediatrics) to be held in April 2011.

(Dr. G.PRAVIN GAVASKAR)

Place: Thanjavur

Date:

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Finally, I thank *almighty* for successful completion of the study.

CONTENTS

INTRODUCTION

Seizures are the most common neurologic disorder in the paediatric age group.

Convulsions as such producing a psychological trauma to the parents and to the patients happen to be a major health problem in many developing countries, which needs more attention to ablate from these stressful events.

Convulsions in childhood are among the most common acute and life threatening problems which cause the parents immediately consult a doctor.

The convulsive disorder is the expression of a sudden, excessive disorderly discharge of neurons in either a structurally normal or diseased cortex. The discharge results in an almost instantaneous disturbance of sensation, loss of consciousness, convulsive movement or some combination of these.

Less than one third of seizures in children are caused by epilepsy, a condition in which seizures are triggered recurrently within the brain.

Accurate diagnosis about the type of convulsions is important since their etiology, therapy and prognosis differ for the different types.

It is important to perform a careful evaluation to look for the cause of seizures as well as to assess the need for treatment with antiepileptic drugs and estimate the potential for response to treatment and remission of seizures in the future.

The history can provide important information about the type of seizures. Seizures that occur during early morning hours or with drowsiness, particularly during the initial phase of sleep are common in children. Irritability, mood swings, headache and subtle personality changes may precede a seizure by several days. Aside from the description of seizure pattern, the frequency, time of day, precipitating factors and alteration in the type of seizures are important. Although that frequency of generalized tonic clonic seizures is readily documented, absence seizures are underestimated.

REVIEW OF LITERATURE

MECHANISM OF SEIZURES:

The precise mechanism of seizures is unknown. Several physiological factors are responsible for the development of a seizure. To initiate a seizure, there must be a group of neurons that are capable of generating a significant burst discharge and impairment of GABA inhibitory system.

Seizure discharge transmission ultimately depends on excitatory Glutaminergic synapses. Evidence suggests that excitatory aminoacid neuro transmitters [Glutamate, Aspartate] may have a role in producing neuronal excitation by acting on specific cell receptors.

Certain seizures are age specific. This suggests that that the underdeveloped brain is more susceptible to specific seizures than the brain of an older child. This implies that the immature brain is more excitable than the mature brain, reflecting the greater influence of excitatory Glutamate containing circuits. The actions of GABA, the major inhibitory neurotransmitter, are often paradoxically excitatory in the immature brain.

The substantia nigra has an integral role in the development of generalized seizures. It has been proposed that the functional immaturity of the substantia nigra may have a role in the increased seizure susceptibility of the immature brain.

Additionally the GABA sensitive substantia nigra play a part in preventing seizures. It is likely that Substantia nigra outflow tracts modulate and regulate seizure dissemination but are not responsible for the onset of seizures.

SEIZURE DEFINITIONS:

· An **epileptic seizure** is a disorder of abnormal synchronous electrical brain activity.

· A **clinical seizure** is a epileptic seizure with symptoms.

· A **subclinical seizure** is a epileptic seizure without symptoms.

· A **non-epileptic seizure (pseudoseizure)** is a disorder with symptoms similar to a epileptic seizure. However, a non-epileptic seizure is not caused by abnormal synchronous electrical brain activity.

· A **cryptogenic seizure** is a seizure that occurs from an unknown cause.

· A **symptomatic seizure** is a seizure that occurs from a known or suspected brain insult known to increase the risk of developing epilepsy.

. An **acute symptomatic** seizure is a seizure that occurs following a recent brain insult.

. A r**emote symptomatic** seizure is a seizure that first occurs long after the brain insult occurred.

· A **provoked** seizure is an acute symptomatic seizure.

· An **unprovoked** seizure is a remote symptomatic or cryptogenic seizure.

· **Idiopathic epilepsy syndromes** are syndromes with specific age of seizures onset, clinical features, EEG features, prognosis and a presumed genetic mechanism.

· A person has **epilepsy** if they have a substantially increased risk for chronic recurrent unprovoked epileptic seizures unless treated by anticonvulsant medications or epilepsy surgery. Epilepsy is diagnosed when the person has a history of multiple unprovoked seizures.

· **Note:** There are two closely related but distinct terms. **Epileptic** means a seizure arising from abnormal synchronous electrical brain activity while **epilepsy** means recurrent unprovoked epileptic seizures.

CLASSIFICATION OF SEIZURES:

Seizures may be classified according to

1. Clinical form
2. EEG findings
3. Aetiology
4. Anatomical findings
5. Age

There have been a number of different classification schemes each with their own terminology and recent attempts to standardise a scheme developed by International Classification of epileptic seizures coming into use.

Their classification is based largely on the seizure type and to a lesser extent on EEG findings.In this classification seizures are divided into main categories- according to whether the initial epileptic discharges affect a localised focus in the brain(partial seizures) or larger areas in both cerebral hemispheres(generalized seizures) .

1. SIMPLE PARTIAL (consciousness retained)

- Motor
- Sensory
- Autonomic
- Psychic

2. COMPLEX PARTIAL (consciousness impaired)

- Simple partial followed by impaired consciousness
- Consciousness impaired at onset
- Partial seizures with secondary generalization

3. GENERALIZED SEIZURES

- Generalized tonic clonic
- Tonic
- Clonic
- Myoclonic
- Atonic
- Absence
  - Typical
  - Atypical
- Infantile spasms

4. UNCLASSIFIED SEIZURES

PARTIAL SEIZURES:

Partial seizures account for a large proportion of childhood seizures upto 40% in some series

SIMPLE PARTIAL SEIZURES:

Motor activity is the most common symptom. The movements are characterized by asynchronous tonic or clonic movements and they tend to involve the face, neck and extremities. Versive seizures consisting of head turning and conjugate eye movements are common. Automatism does not occur. Aura such as chest discomfort, head ache may occur. Aura may be the only manifestation of the seizure. The average seizure persists for 10 to 20 sec. The child remains conscious and may verbalise during the seizure. No post ictal phenomenon follows the event.

Simple partial seizures may be confused with tics. Tics are characterized by shoulder shrugging, eye blinking and facial grimacing and primarily involve the face and shoulder. Tics may be briefly suppressed .but partial seizure cannot be controlled.

1. With motor symptoms

Clonic seizure activity may begin in a single muscle group usually start from finger flexors and then extends to contiguous groups until one side of body is involved. The patient remains alert till the seizure activity spreads to other cerebral hemisphere leading to generalized tonic clonic seizures.

A focal motor seizure is often associated with transient paralysis on the affected side [todd's paralysis] and this may last up to 24 hours. If the focal motor seizure activity lasts over a period of weeks, months or even years, it is known as Epilepsia partialis continua. In children it is usually a manifestation of chronic focal encephalitis.

2. With sensory symptoms

These are usually associated with transient sensation of pins and needles or numbness on one side. Sensation of flashing white light is seen in visual seizures due to occipital lobe involvement. Olfactory seizures may begin as unpleasant odours. In vertiginous seizures other causes of vertigo including benign paroxysmal vertigo, migraine and labrynthitis has to be excluded.

3. With autonomic symptoms

Autonomic seizures consist of transient disturbances in vegetative function. Symptoms and signs include pallor, flushing, headache, tachycardia, dilatation of the pupils, abdominal pain and loss of bladder control. Autonomic symptoms are commonly associated with complex partial seizure.

COMPLEX PARTIAL SEIZURES:

Complex partial seizure may begin with the simple partial seizure with or without an aura followed by impaired consciousness. Conversely the onset may coincide with an altered state of consciousness. The presence of an aura always indicates focal onset of the seizure. Impaired consciousness in infants and children may be difficult to appreciate. There may be a brief blank stare or sudden cessation in activity. The child is unable to communicate or to describe the periods of impaired consciousness in most cases.

Automatism is a common feature of complex partial seizure occurring in 50 to 75% of cases. Older the child greater is the frequency of automatism. Automatism develops after the loss of consciousness and may persist into the post ictal phase. They are not recalled by the child. Alimentary automatism includes lip smacking, chewing, swallowing and excessive salivation. These movements can represent normal infant behavior and are difficult to distinguish from the automatism. Gestural automatism include picking and pulling of clothing or bed sheets,

rubbing objects and walking or running in a non directive, repetitive and often fearful fashion.

Spreading of the epileptiform discharge during CPS can result in secondary generalization with a tonic clonic convulsion. During the spread of the ictal discharge contralateral versive turning of the head, dystonic posturing and tonic or clonic movements of the extremities and face including eye blinking may be noted. The duration of a seizure is one to two minutes.

GENERALIZED SEIZURES:

Generalized seizures affect the brain as a whole including both cerebral hemispheres and often also sub cortical structure with loss of consciousness. But in some conditions such as generalized myoclonic seizure the loss of consciousness is so short that it is hardly noticeable. They may be focal in onset and then become generalized or may be generalized from the onset.

TONIC CLONIC SEIZURES:

These seizures are common and may follow a partial seizure or occur de novo. They may be associated with an aura suggesting a focal origin of the epileptiform discharge. Patients suddenly lose consciousness, their eyes roll back, their entire body musculature undergoes tonic contractions and they rapidly become cyanotic in association with apnoea. The teeth are tightly clenched and tongue may be bitten. Excessive salivation, vomiting, loss of bowel and bladder

control may occur as a result of autonomic nervous system involvement during tonic phase.

The tonic phase is followed by clonic phase. At the end of the seizure the patient relaxes, respiration becomes normal and the patient passes into post ictal depression. When the patient awakens, severe headache and muscle aches are noted. Metabolic disturbances occur after prolonged seizures which include hypoxemia, hypercarbia, respiratory acidosis and lactic acidosis. Factors precipitating seizures include low grade fever associated with non central nervous infections, excessive fatigue or emotional stress.

In status epilepticus repeated tonic clonic seizures without intervening recovery of consciousness. It is classified as

1. Convulsive status epilepticus- the commonest type in which the patient does not recover to a normal alert state between repeated clonic tonic attacks

2. Non convulsive status epilepticus such as absence status and complex partial status in which the clinical presentation is a prolonged twilight state.

3. Epilepsia partialis continua- in which consciousness is preserved.

ABSENCE SEIZURES:

TYPICAL ABSENCE SEIZURES:

There is sudden deep arrest of motor activity along with a blank stare and loss of awareness and loss of consciousness which is so short that the patient does not remember the attack but feel that a short period of time has been lost .These seizures are uncommon before 5 years of age, are more prevalent in girls, are never associated with an aura, rarely persists longer than 30 seconds and are not associated with a post ictal state. Children may experience countless attacks daily. Patients do not lose body tone.

ATYPICAL ABSENCE SEIZURES:

They have associated motor symptoms such as lip smacking or fumbling with hands or autonomic disturbances including loss of bladder control. Sometimes the seizures become almost continuous for hours or days and child passes into a constant state of stupor (petit mal status or spike wave stupor)

MYOCLONIC SEIZURES:

It consists of sudden brief shock like contractions of the muscles more of involving both sides. There is often sudden fall in older childre with generalized myoclonic seizures.

DIFFERENTIAL DIAGNOSIS OF SEIZURES:

- Syncope of cardiac origin
  - Arrhythmias
    - Supraventricular arrhythmias
    - Atrial fibrillation
    - Paroxysmal atrial tachycardia
    - Stokes Adams attacks
    - Heart block
  - Congenital heart disease
  - Cardiomyopathies
  - Atrial myxoma

- Syncope of noncardiac origin
  - Vasovagal
    - Micturition
    - Tussive
    - Carotid sinus disturbance
  - Valsalva
  - Hyperventilaton
  - Breath holding spell
    - Pallid &cyanotic
  - Recurrent abdominal symptoms
    - Recurrent abdominal pain
    - Cyclic vomiting with migraine

    - Cyclic vomiting with gastro esophageal reflex (Sandifer's syndrome)
- Migraine
- Transient global amnesia
- Cerebrovascular disease
- Metabolic disturbances
    - Hypoglycaemia
    - Porphyria
    - Renal/hepatic disease
- Psychiatric diseases
    - Anxiety/panic disorder
    - Conversion disorder
    - Episodic dyscontrol disorder
- Sleep disorders
    - Narcolepsy
    - Parasomnia
    - Paroxysmal nocturnal choreoathetosis
- movement disorders
    - paroxysmal dyskinesias
- Toxic disturbances
    - strychnine
    - carbon monoxide poisoning
    - cyanide
- orthostatic
    - autonomic neuropathies

    - porphyria
    - familial dysautonomia
    - diabetes
    - hypovolemia
- Childhood masturbation
- Psychogenic seizures

PRINCIPLES OF ANTICONVULSANT THERAPY:

· Select the anticonvulsant that is most appropriate for the seizure type.

· Identify any special considerations that apply to a individual case that would make one anticonvulsant superior. Special considerations include anticonvulsant side effects, dosing schedule and availability of intravenous administration.

· Single drug therapy (**monotherapy**) is usually best; multiple anticonvulsant therapy (**polytherapy**) is more costly and more likely to cause medication side effects.

· Neurontin, lamictal, topiramate, tiagabine, levetiracetam, oxcarbazepine and zonisamide have minimal hepatic and protein binding interactions with other anticonvulsants. These drugs are good to use when polytherapy is required.

· Initial anticonvulsant therapy usually begins with the less expensive appropriate anticonvulsants. Phenytoin and carbamazepine are significantly less expensive than valproate, lamictal, gabapentin, topiramate, oxcarbazepine, zonisamide, tiagabine, levetiracetam and felbamate. Ethosuximide is less expensive than valproate.

· Phenobarbital is generally not used as a initial anticonvulsant because phenobarbital often causes intolerable sedative and cognitive side effects.

· Primidone is generally not useful. It has side effects similar to phenobarbital, is more expensive than phenobarbital and requires multiple daily doses.

· Benzodiazepines are generally not useful for chronic anticonvulsant management.

ANTICONVULSANT DRUGS:

The drug of choice depends on the classification of seizures. The goal for every patient should be the use of only one drug with fewest possible side effects for the control of seizures. The drug is increased slowly until seizure control is accomplished or until undesirable side effects develop.

There are several important indications for anticonvulsant drug monitoring

1. At the onset of anticonvulsant therapy to confirm that the drug level is within the therapeutic range
2. For non compliant patients
3. During accelerated growth spurts
4. For patients on polytherapy
5. Uncontrolled seizures
6. Seizures that have changed in type
7. For symptoms and signs of drug toxicity
8. For patients with hepatic or renal disease
9. For children with physical or cognitive disabilities

SODIUM VALPROATE:

It is a broad spectrum anticonvulsant .It acts by blocking voltage dependent sodium channels and increases calcium dependent potassium conductance. This drug is useful for the management of generalized tonic clonic, absence, myoclonic seizures.

Its side effects are mild gastrointestinal disturbances, alopecia, tremor and hyperphagia. Too rare but serious side effects are Reye like syndrome and irreversible hepatotoxicity.

CARBAMAZEPINE:

It acts by decreasing the sustained repetitive firing of neurons by blocking sodium dependent channels and by decreasing depolarization dependent calcium uptake. It is effective for the generalized tonic clonic and partial seizures.

Side effects are leukopenia, hepatotoxicity and hyponatremia. The plasma concentration of carbamazepine is lowered by phenytoin, phenobarbitone and sodium valproate.

PHENOBARBITONE:

It acts on the GABA receptor to increase the Chloride channel open duration. They are useful for generalized tonic clonic seizures. It adversely affects the cognitive function of children treated on a long term

basis. Valproic acid interferes with the metabolism of phenobarbitone causing elevated phenobarbitone levels and toxicity.

PHENYTOIN:

Acts by blocking sodium dependent channels and decreasing depolarization dependent calcium uptake. It is used for primary and secondary generalized tonic clonic and partial seizures.

LAMOTRIGENE:

Acts at voltage sensitive sodium channels to stabilize neuronal membranes and inhibits neuronal release particularly glutamate. It is effective for the management of generalized tonic clonic and complex partial seizures.

Side effects include nausea, headache, blurred vision, diplopia, ataxia, angioedema, Steven Johnson syndrome and toxic epidermal necrolysis. Sodium valproate inhibits the metabolism of lamotrigene.

GABAPENTIN:

It acts by binding to glutamate synapses and increased brain GABA turnover. It is used for refractory complex partial and secondarily generalized tonic clonic seizures. It has no significant drug interactions.

TIAGABINE:

Acts by blocking reuptake of GABA into neuronal cells. It is effective in the management of complex partial seizure as an add on drug.

TOPIRAMATE:

It acts by blocking the voltage dependent sodium channels. It is used for refractory complex seizures with or without secondary generalization.

VIGABATRIN:

Acts by binding to the GABA transaminase receptor causing an increase in GABA levels. It is used as an adjunctive therapy for poorly controlled seizures.

LEVIRACTAM:

Acts by an unknown mechanism and used as an adjunctive treatment for uncontrolled seizures.

ZONISAMIDE:

Mechanism of action is unclear. It is useful as an adjunctive treatment for partial seizures and myoclonic syndromes.

ROLE OF KETOGENIC DIET:

This should be considered for management of recalcitrant seizures. The diet restricts the quantity of carbohydrate and protein and most calories are provided as fat. Although the mechanism of action is unknown some evidence shows that it exerts an anticonvulsant effect secondary to elevated levels of beta hydroxyl butyrate and acetoactate resulting from ketosis. The use of valproic acid is contraindicated in association with ketogenic diet because of the risk of hepatotoxicity.

COMPUTED TOMOGRAPHY –BRAIN IN CHILDREN:

TECHNIQUES AND EVALUATION:

It is a basic radiologic tenet that the interpretive accuracy and ultimate worth of any radiologic examination; be it chest x ray or contrast studies is dependent on the technical quality of the examination.

No where in radiology, is that tenet more applicable than to CT of infants and children.

Two important and fundamental misconceptions about CT scanning should be dispelled at the outset.

Misconception 1:

CT scanning is a simple non invasive imaging technique.

Although this statement is often made it is not so to CT scanning of children. First the procedure is not simple. Examination of the children is fraught with significant inherent difficulties that are not present in adults.

Secondly though CT scanning may be less invasive than some procedures such as angiography it might be difficult receiving intravenous contrast material and possibly receiving an intramuscular injection for sedation.

Misconception 2:

CT scanning is not appropriate in the children.

Certainly more care should be taken with children and that a CT examination is more difficult to perform in the pediatric age group.

However when appropriately utilized and performed , CT scanning in children is an extremely valuable procedure in children that can provide important diagnostic information that is not otherwise not available.

EQUIPMENT:

State of the art technology including equipment with scan time is necessary for CT scanning in the pediatric population. Examinations should be done with optional time. Sub optional time may cause motion artifacts.

PATIENCE AND UNDERSTANDING:

These are intangible attributes that the technicians and the expert performing CT examinations must possess. As far as possible explain the procedure to utilize children who are old enough to understand. It may be helpful to have someone present for the scanning process with whom the child is familiar.

SEDATION:

As discussed in procedures in children younger than four to five years of age better to use sedation. Sometimes children more than five

years of age sedation may be exception rather than the rule, especially the patient of behavioural problems subjected for CT scanning.

IMMOBILISATION:

Immobilisation of the child is important in the CT scanning as in other paediatric radiologic examination. Even in sedation some amount of immobilisation is recommended. This can be accomplished by using a blanket, adhesive tape and light sand bag. Body and chest are wrapped in a blanket which is then scanned to the scanning board with adhesive tape, a light sand bag may be used to restrain the lower extremities.

In older children, co operative child this type of immobilisation is unnecessary.

ENHANCEMENT WITH INTRAVENOUS CONTRAST MEDIUM:

This can be of great value in evaluation and interpretation of paediatric scans aiding in delineation both normal and pathologic anatomy. This will provide valuable anatomic information about pathological processes and the relationship of the mass surrounding vessels, near by structures etc. The large scalp vein needle which can be placed, preferably a 19 gauge or 21 gauge needle is recommended. The contrast agent is sodium iothalamite administered intravenously as a bolus in a dose of 2ml/kg by iv upto a maximum of 20ml is being used. Scanning is begun after half of the bolus is injected and it is continued during the remainder of the injection and until the appropriate images have been obtained. This contrast study is performed after the

noncontrast study has been reviewed by the radiologist or experts in paediatric neurology, so that images enhanced with contrast medium may be obtained in regions of maximal interest.

IMAGING SEQUENCE AND LOCALISATION:

Reference point: ORBITO MEATAL LINE

Usually 10mm slices are preferred and 9-10 cuts to include high parietal regions also. In area of interest 2mm slices, sometimes even with contrast may be of value.

TIME OF EXPOSURE:

Standard time 5-7.5 seconds, but vary with the equipment to avoid motion artifacts, short duration of exposure and skilled professional is always ideal.

ADDITIONAL SUGGESTIONS:

Maintenance of thermal homeostasis

Radiologist /neurologist supervising and interpreting the CT examination must have the complete clinical information prior to the procedure as well as access to the previous studies.

CT brain and convulsion on many occasions go hand in hand for effective and correct diagnosis for the institution of appropriate therapy.

Many studies were conducted on clinical presentation and with EEG abnormalities. Review of literature shows only few conducted exclusive study on CT findings in convulsive disorders of infancy and childhood.

The cost benefit of CT brain is high for developing countries; it cannot be used as a diagnostic tool for all seizure cases. So the paucity of the knowledge about the yield of CT findings in different types of convulsive disorders of infancy and childhood in developing countries has stimulated this study.

AIM OF THE STUDY:

Only very few conducted study on the value of CT in infants and childhood convulsion and its yield in different types of convulsion. Since paucity of above study for the patients admitted in peripheral medical institutions, which has stimulated to conduct a study on this.

AIM:

To find out the high yield group, for effective usage and application of CT as a diagnostic tool.

To know about commonest findings in convulsive disorders.

Detection of treatable causes of intracranial pathology and to explain the prognosis and outcome to the worrying parents and patients.

MATERIALS AND METHODS:

The materials here are patients in the age group of one to twelve years with convulsive disorders. The method is CT brain.

INCLUSION CRITERIA:

- Age 1 To 12 Years

EXCLUSION CRITERIA:

- Febrile Seizure
- H/O Neonatal Seizures
- H/O Trauma
- H/O Cerebral Palsy
- H/O Global Developmental Delay
- Known Case of Metabolic Disorder
- Past H/O Meningitis
- Known Case of Neuro Degenerative Disorder

DURATION OF STUDY:

- March 2010 to August 2010

TYPE OF STUDY:

- Prospective study – Simple Randomized

Patients were selected in the paediatric ward of Raja Mirasudhar Hospital, Thanjavur.

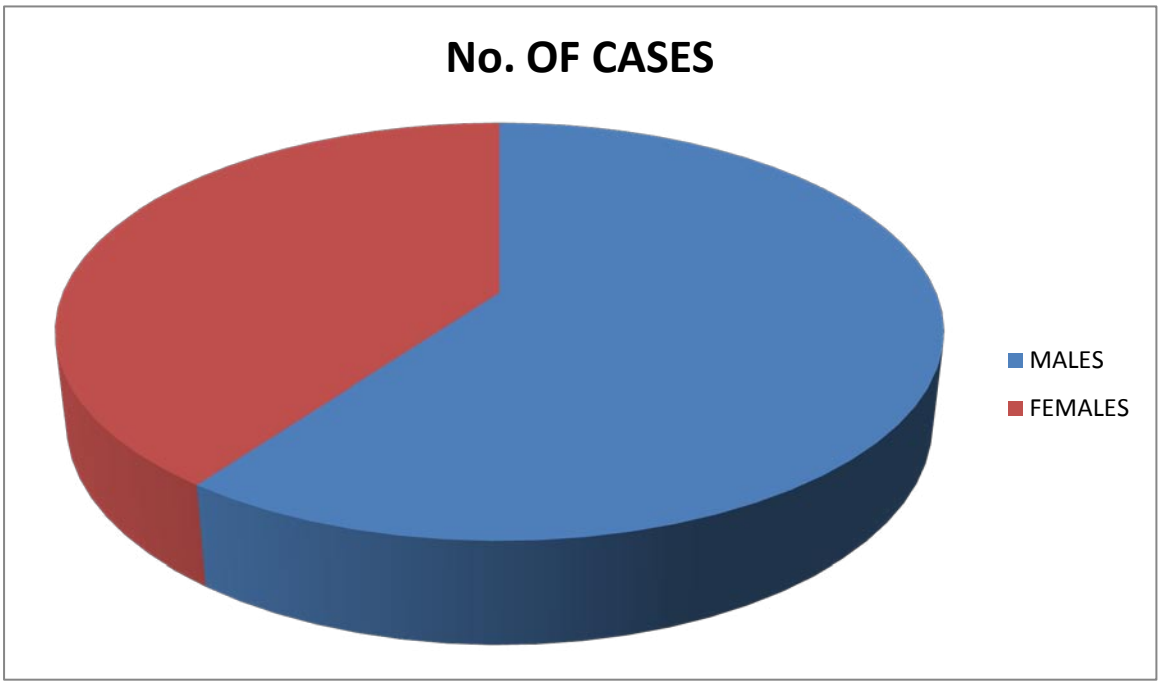
The patients were subjected for CT brain with the help of neuro physician at Thanjavur Medical College hospital, thanjavur.

Procedure of CT brain as mentioned in the introduction were followed and the patients were given sedation whenever necessary. Then the results interpreted by the neurologists taken into account for further management of patients were accordingly tailored.

RESULTS AND OBSERVATION:

SEX DISTRIBUTION:

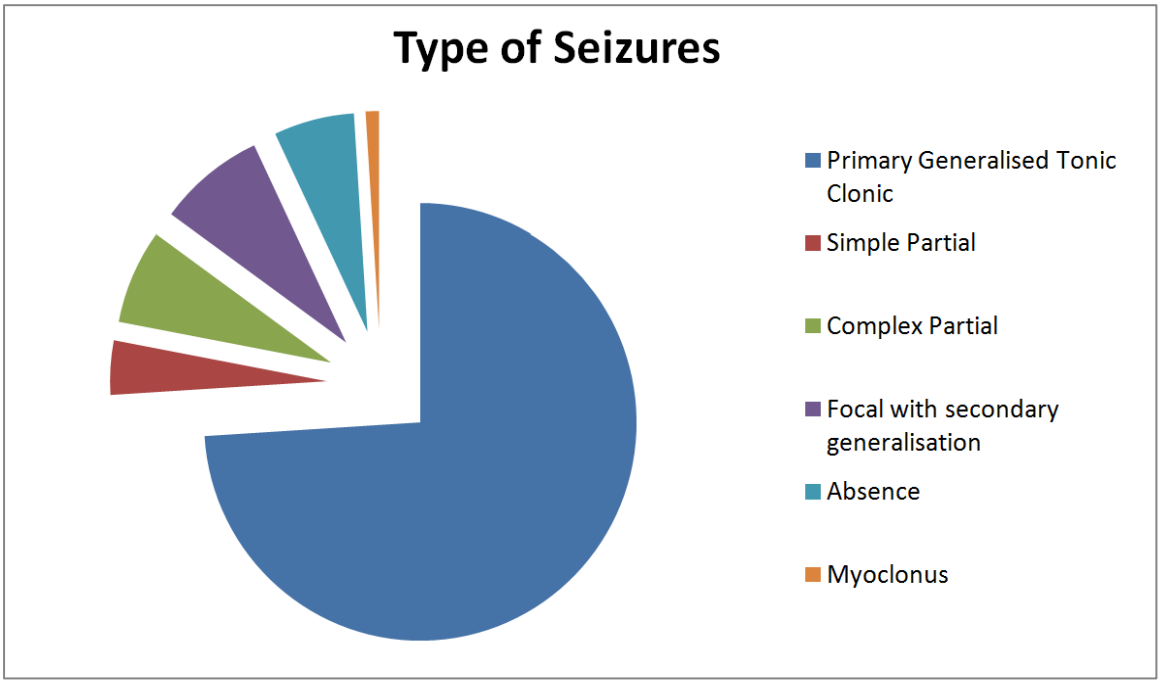
MALE	60
FEMALE	40
TOTAL CASES	**100**



TYPE OF SEIZURES:

Type of Seizures	No. of Cases
Primary Generalized Tonic Clonic	74
Simple Partial	4
Complex Partial	7
Focal with secondary generalization	8
Absence	6
Myoclonus	1

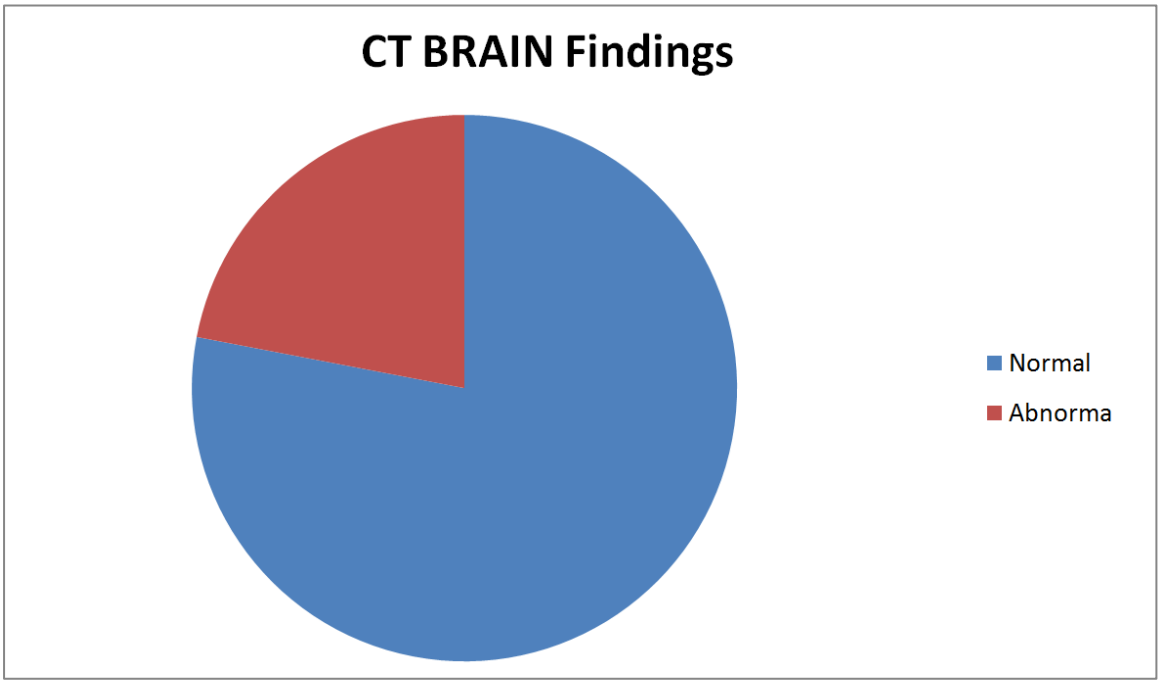
TYPE OF SEIZURES:



CT BRAIN:

NORMAL- 78

ABNORMAL- 22

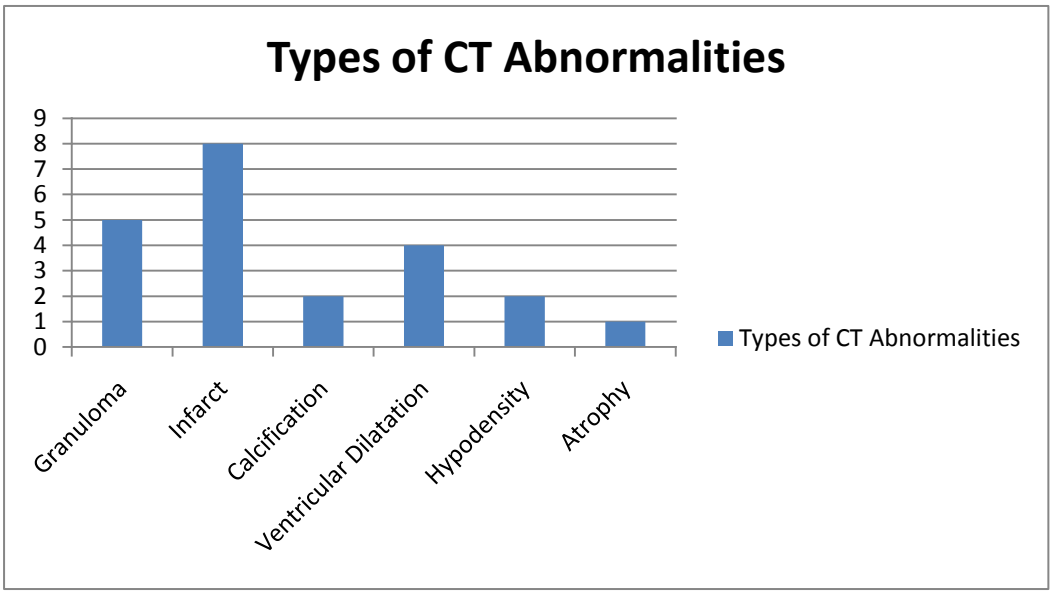


TYPES OF CT ABNORMALITIES SEEN:

Among the different types of CT findings, Infarct was the most common lesion observed.

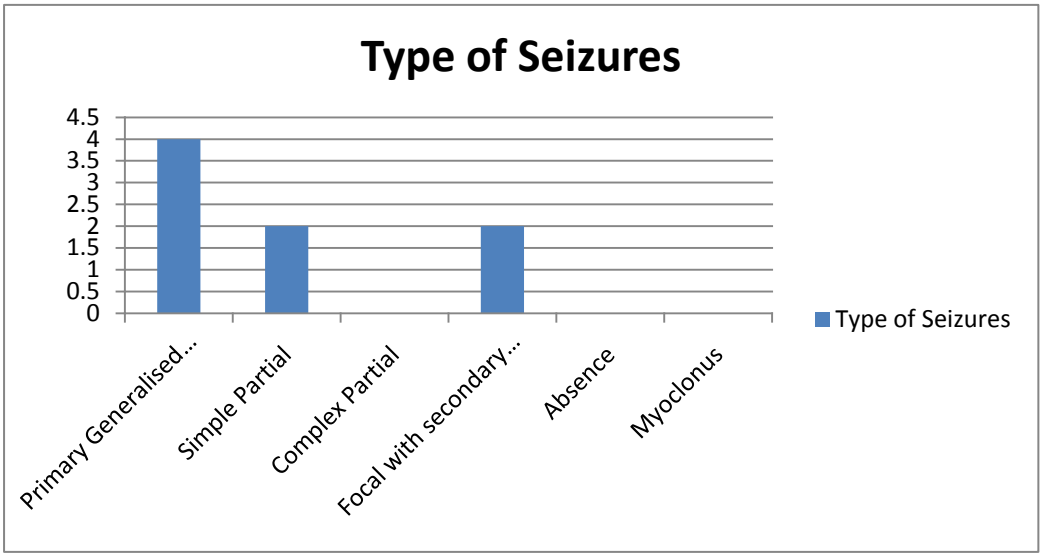
Types of CT Abnormalities	No. of Cases
Granuloma	5
Infarct	8
Calcification	2
Ventricular Dilatation	4
Hypodensity	2
Atrophy	1

TYPES OF CT ABNORMALITIES SEEN:

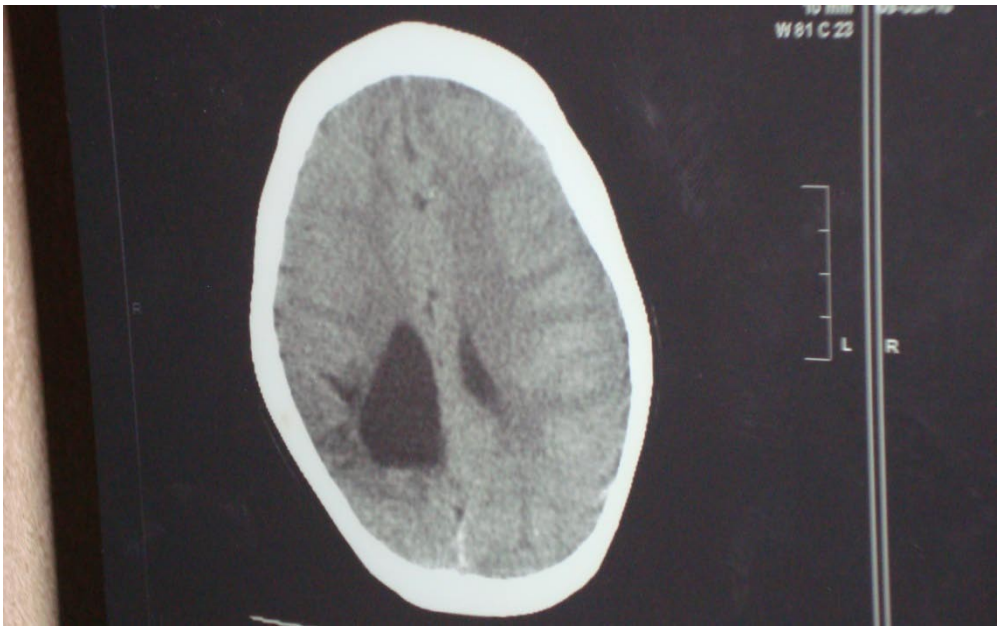


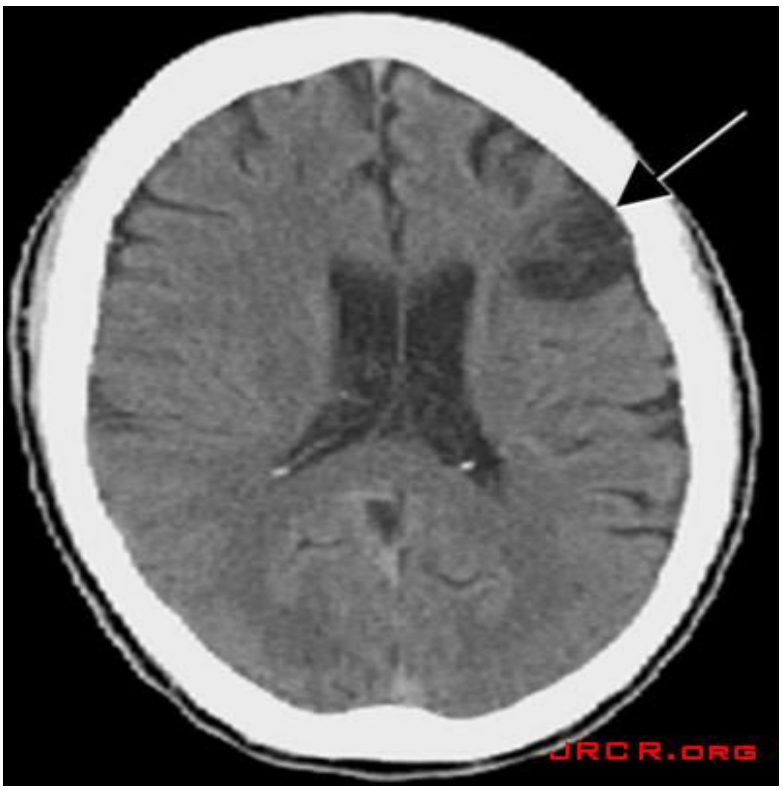
INFARCT: Of the total 22 abnormal findings, Infarct accounted for 8 cases. Of which GTCS 4 cases, simple partial seizure 2 cases, focal with secondary generalization 2 cases.

Type of Seizures	No. of Cases
Primary Generalized Tonic Clonic	4
Simple Partial	2
Complex Partial	0
Focal with secondary generalization	2
Absence	0
Myoclonus	0



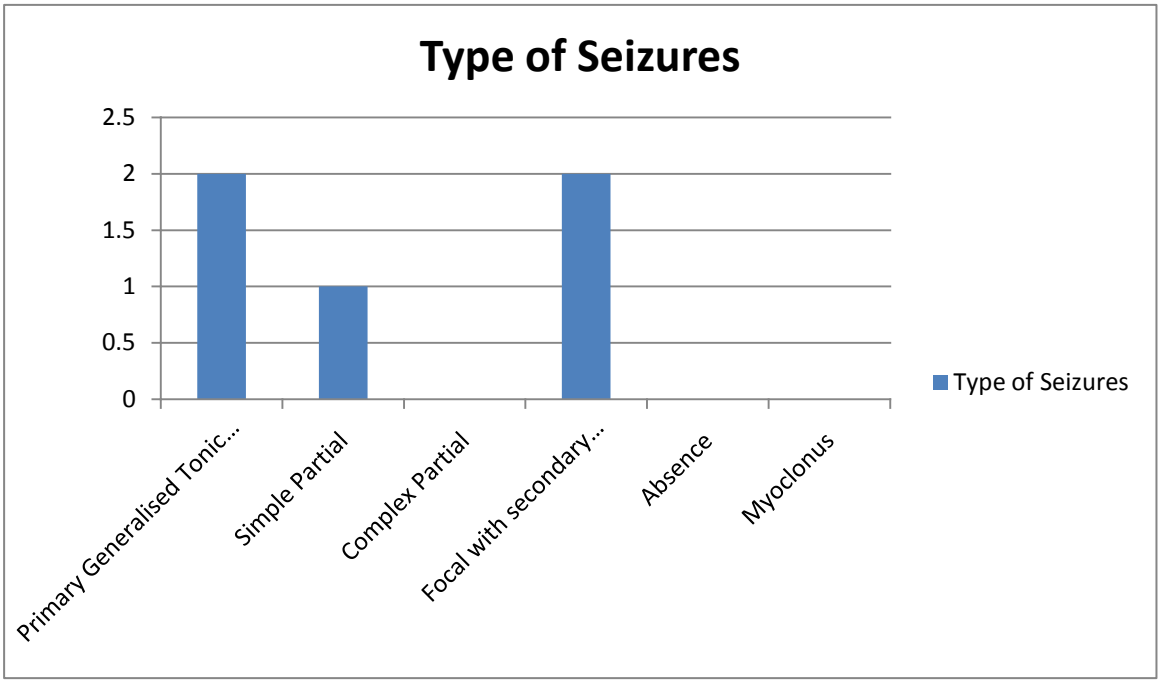
INFARCT



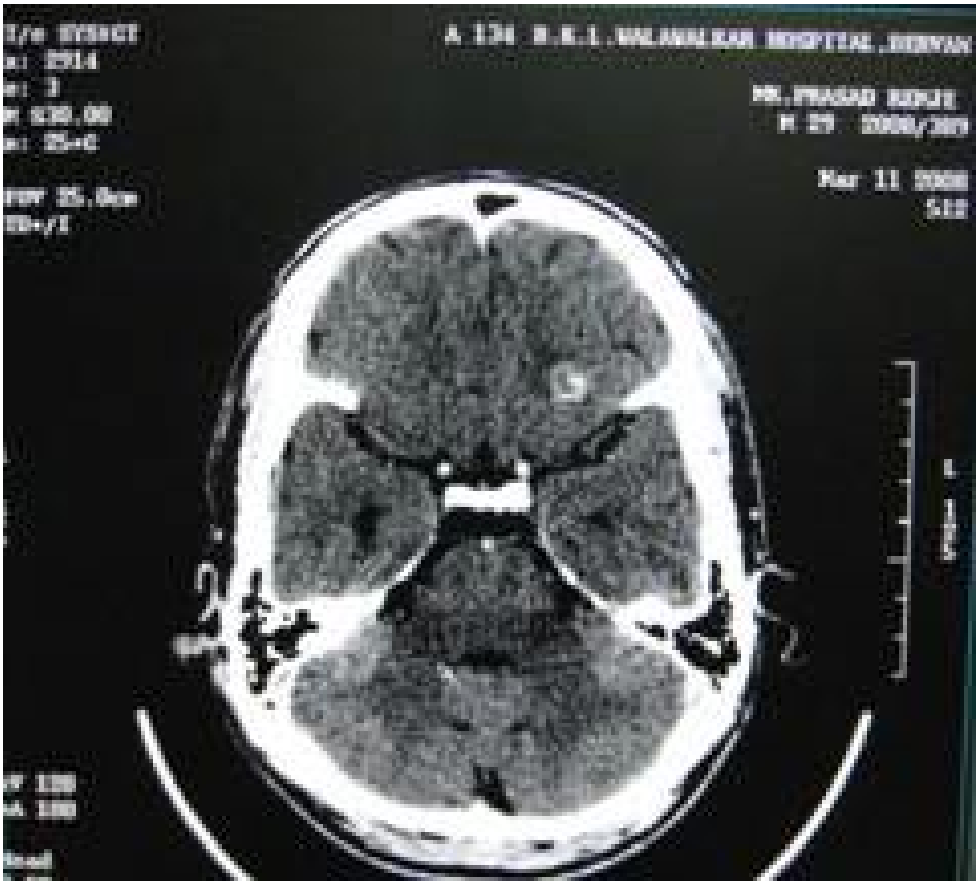


GRANULOMA: Of the total 22 abnormal CT findings granuloma accounted for 5 cases. Of which GTCS 2 cases, simple partial seizure 1 case, focal with secondary generalization 2 cases.

Type of Seizures	No. of Cases
Primary Generalized Tonic Clonic	2
Simple Partial	1
Complex Partial	0
Focal with secondary generalization	2
Absence	0
Myoclonus	0

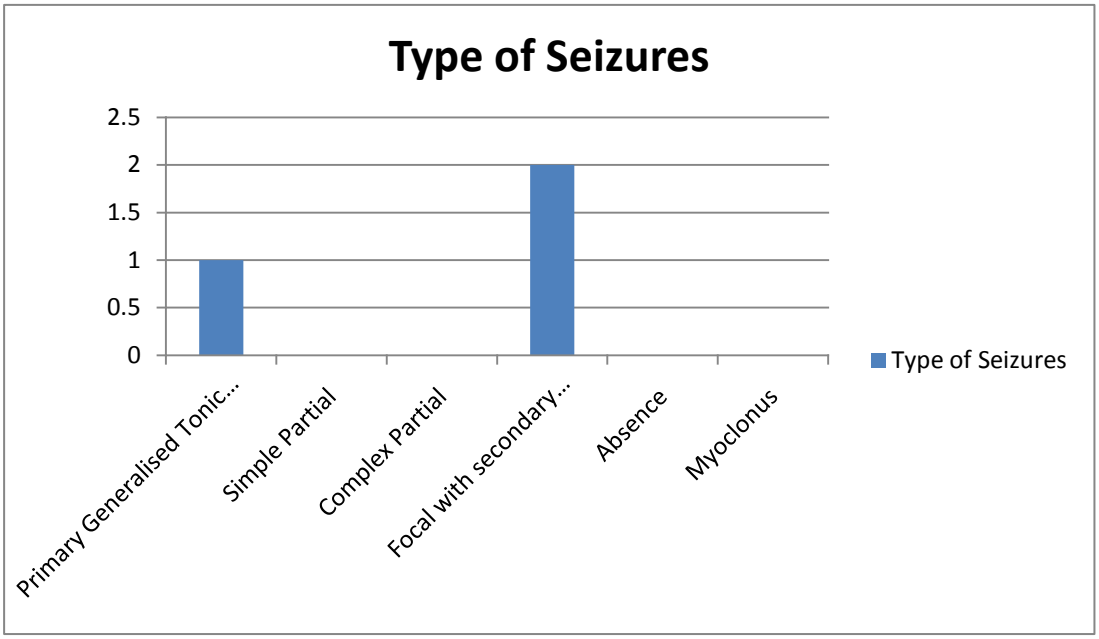


GRANULOMA

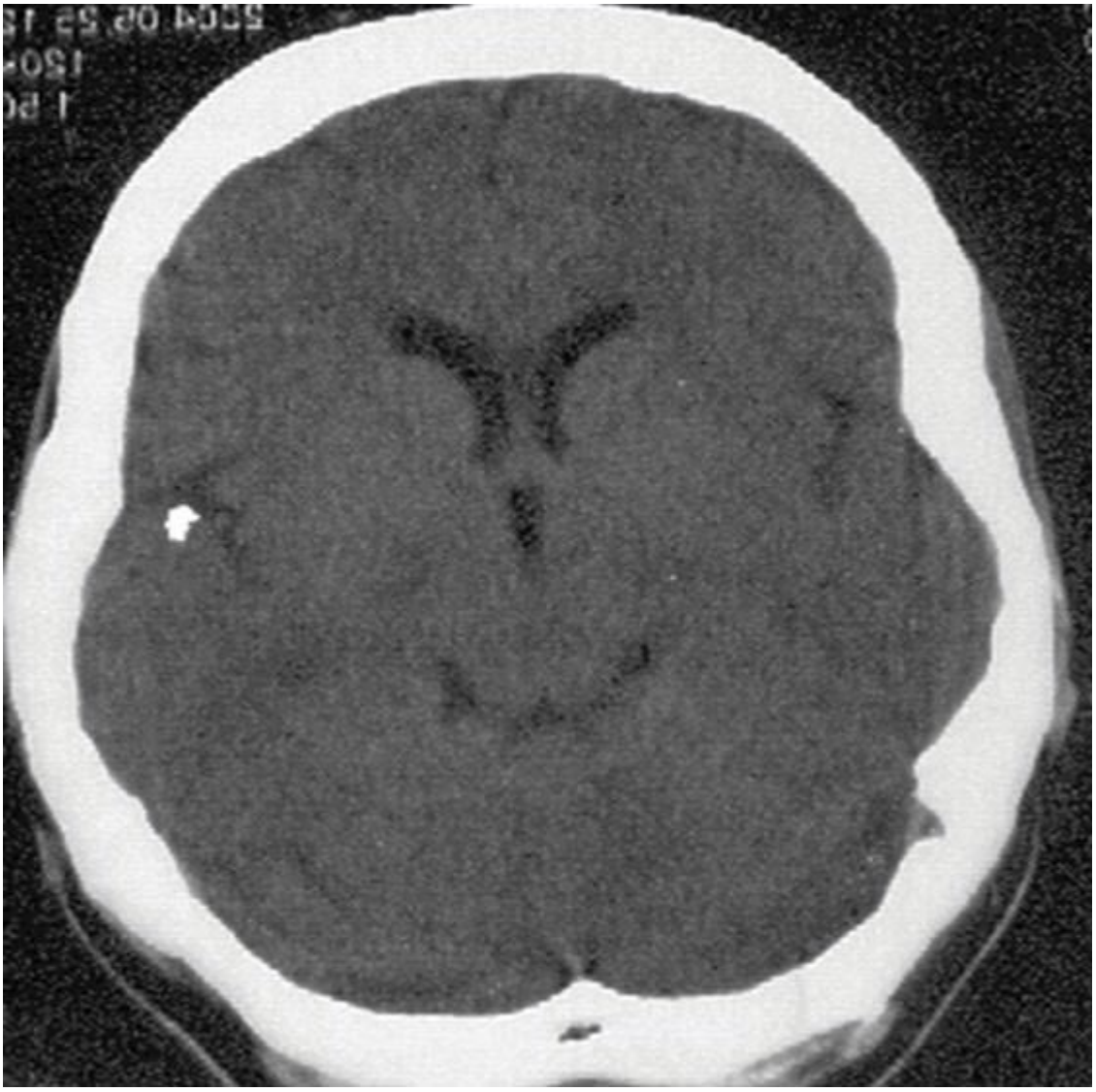


CALCIFICATION: Of the total 22 abnormal findings, Calcification accounted for 2 cases. Of which GTCS 1 case, focal with secondary generalization 1.

Type of Seizures	No. of Cases
Primary Generalized Tonic Clonic	1
Simple Partial	0
Complex Partial	0
Focal with secondary generalization	1
Absence	0
Myoclonus	0

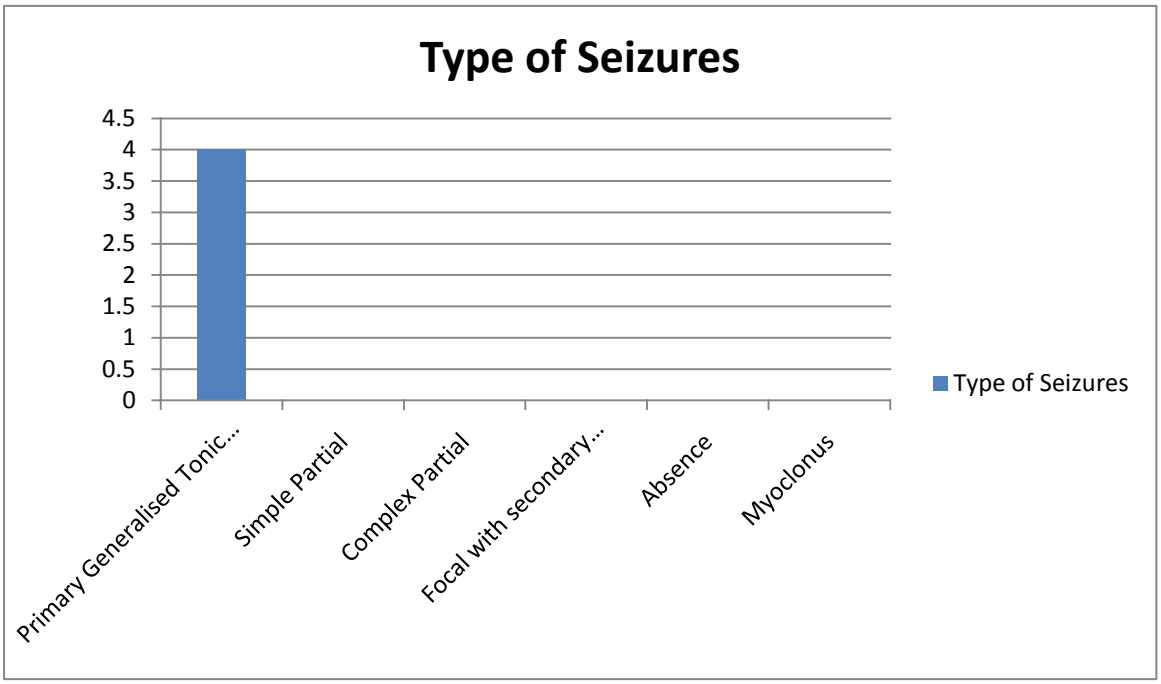


CALCIFICATION

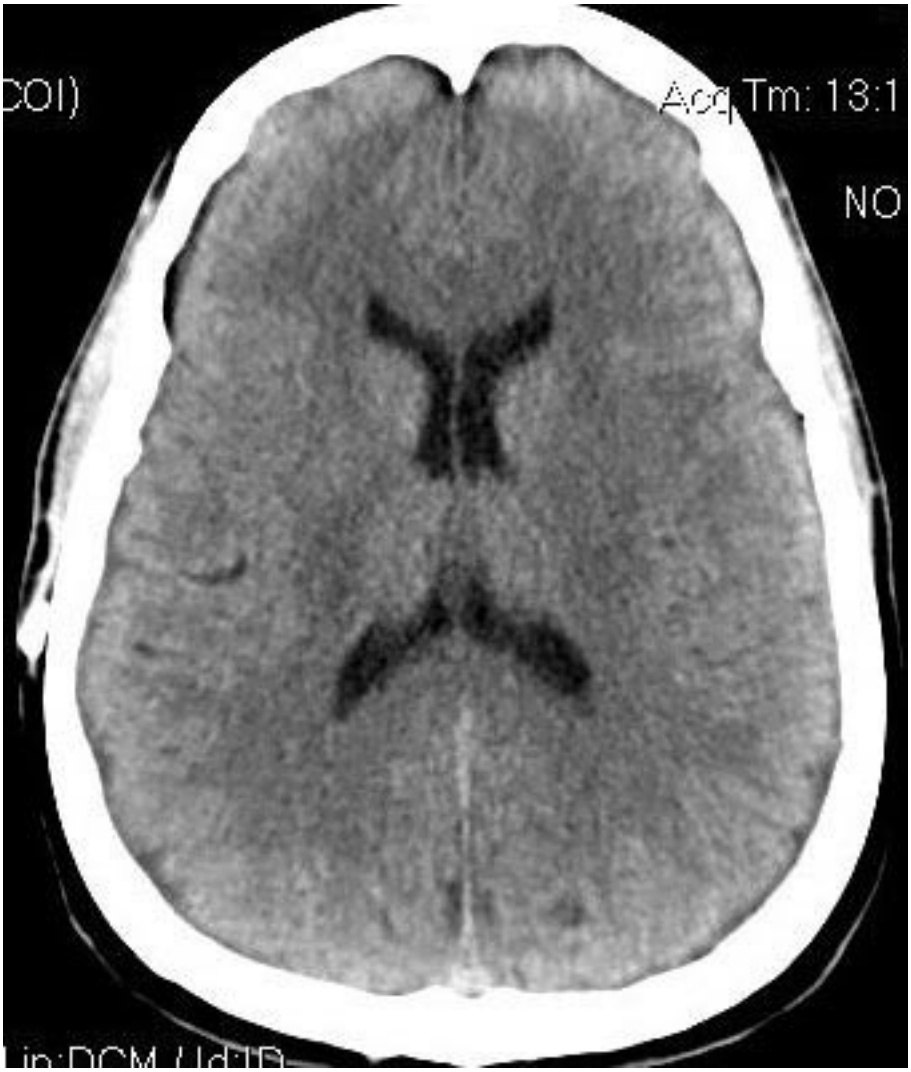


VENTRICULAR DILATATION: Of the total 22 abnormal findings, Ventricular dilatation accounted for 4 cases. Of which all are GTCS

Type of Seizures	No. of Cases
Primary Generalized Tonic Clonic	4
Simple Partial	0
Complex Partial	0
Focal with secondary generalization	0
Absence	0
Myoclonus	0

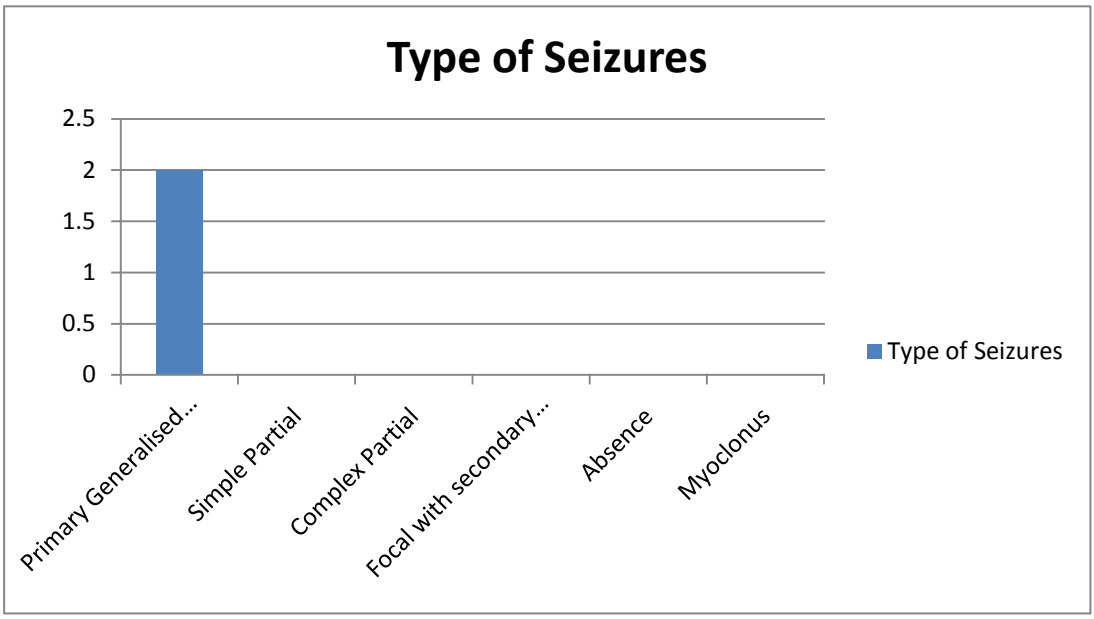


VENTRICULAR DILATATION



HYPODENSITY: Of the total 22 abnormal findings, Hypodensity accounted for 2 cases. Of which all are GTCS.

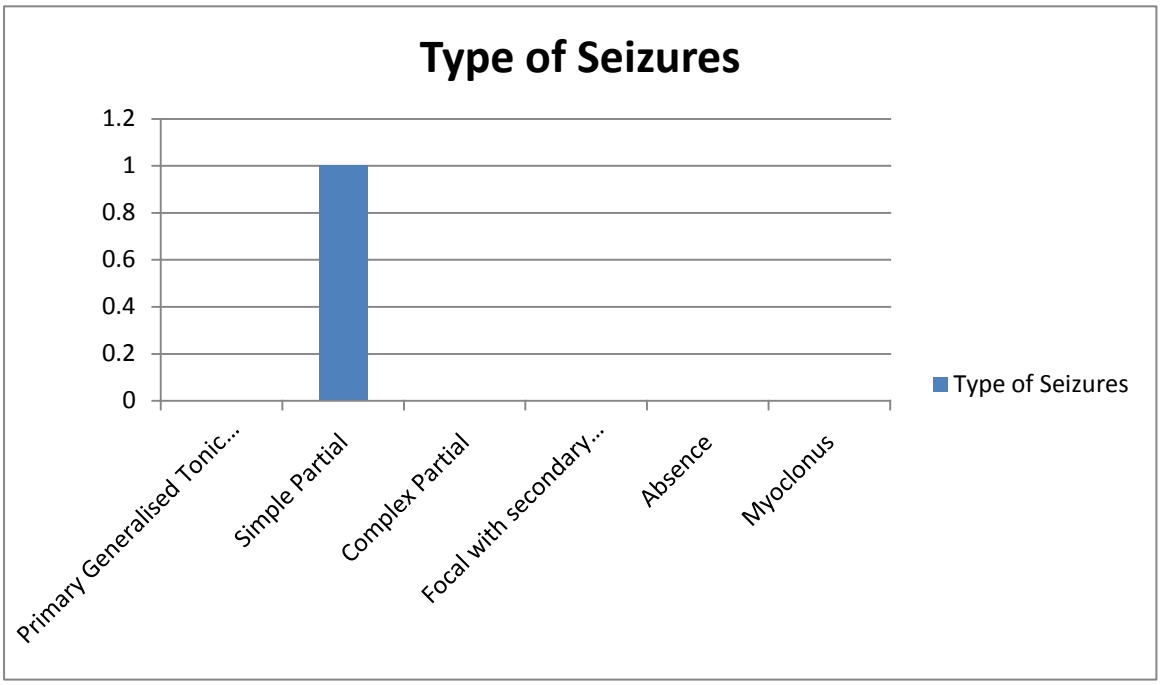
Type of Seizures	No. of Cases
Primary Generalized Tonic Clonic	2
Simple Partial	0
Complex Partial	0
Focal with secondary generalization	0
Absence	0
Myoclonus	0



HYPODENSITY

ATROPHY: Of the total 22 abnormal findings, Atrophy accounted for 1 case which is simple partial seizure.

Type of Seizures	No. of Cases
Primary Generalized Tonic Clonic	0
Simple Partial	1
Complex Partial	0
Focal with secondary generalization	0
Absence	0
Myoclonus	0



In the present, of total 100 cases studied, 74 cases were GTCS. Of which 13 cases showed abnormal CT findings as

Granuloma	2
Infarct	4
Ventricular dilatation	4
Hypodensity	2
Calcification	1

Of the total 100 cases studied, 4 cases were simple partial seizures. All showed abnormal CT findings as

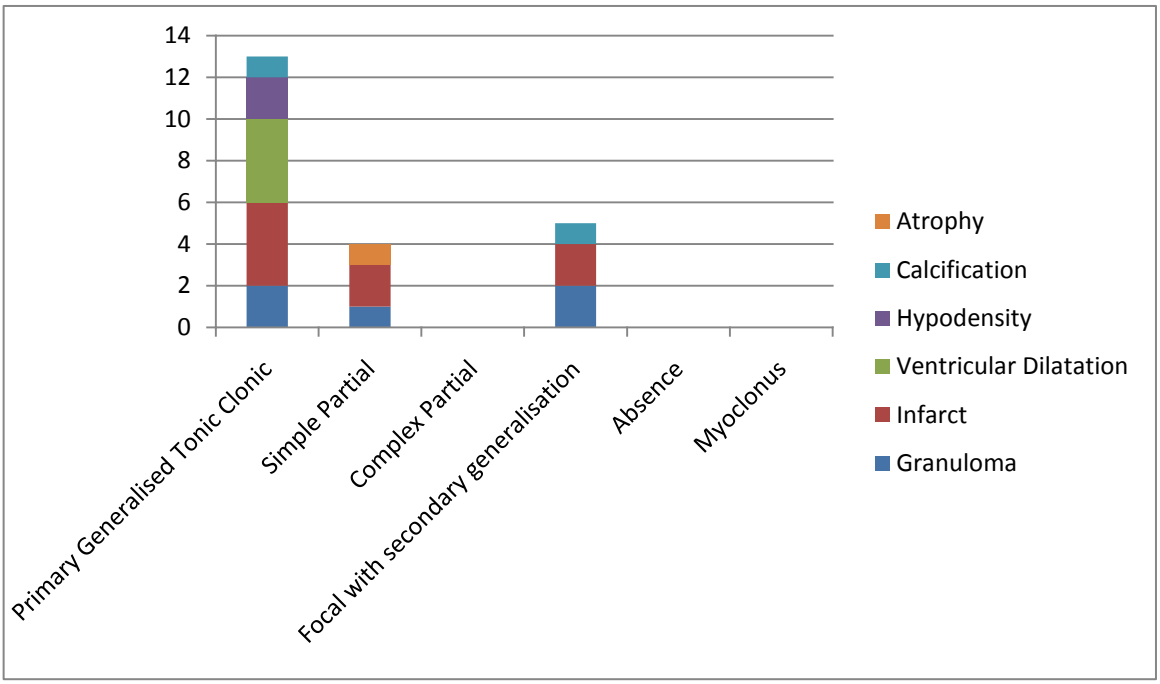
Granuloma	1
Infarct	2
Atrophy	1

Of total 100 cases studied, 8 cases were focal with secondary generalization of which 5 showed abnormal CT findings as

Granuloma	2
Infarct	2
Calcification	1

Cases which presented as complex partial, absence seizures, myoclonus did not yield any abnormal finding on CT brain study.

CT ABNORMALITIES IN DIFFERENT TYPE OF SEIZURES:



DISCUSSION:

The magnitude of problems of convulsions as leading manifestations of a medical or neurological disease can hardly be overstated. The magnitude of the problem will be evident from the figures given below.

Paediatric department statistics for the year 2010, Raja Mirasudhar Hospital shows

Total number of admissions	4784
No of children admitted with convulsions	397

So 8.3 % of admissions in this hospital is with seizure disorder.

Most of the published observations and studies on CT findings in seizure disorder were either they concentrate on neonates or both neonate and childhood. Many studies of CT findings in seizure disorders were conducted on adults than on children.

TABLE SHOWING PERCENTAGE OF ABNORMAL CT FINDINGS:

TYPE OF SEIZURE	NO OF CASES	NO OF ABNORMAL CT FINDINGS	PERCENTAGE
TONIC CLONIC	74	13	17.56%
SIMPLE PARTIAL	4	4	100%
COMPLEX PARTIAL	7	0	0%
FOCAL WITH SEC.GEN	8	5	62.5%
ABSENCE	6	0	0%
MYOCLONUS	1	0	0%
TOTAL	**100**	**22**	

From the neurology clinic, Ruby Hall Clinic and Sasson General Hospital Pune and The Poona Medical Centre, Pune,1998, India did a study on 150 consecutive cases of Simple partial seizures in children. Significant CT abnormalities were found in 68%.The commonest lesion noted was a hypodense lesion on unenhanced scan, with a ring or disc like enhancement on contrast scan, and surrounding hypodensity. This lesion was seen in 39 cases and in those with shorter duration of fits (<6months). Nineteen of these cases had focal signs. Ten cases with a ring or disc enhancing lesion had evidence of tuberculosis elsewhere in the body, three more had a past history of tuberculosis and four others had a history of close contact with tuberculosis.

Journal of Tropical Paediatrics Volume 36, issue 3. One hundred unselected children with partial motor seizures were subjected to CT scan. 73 children had an abnormal scan. Of this 56 patients had either a ring (35 patients) or a disc like (21patients) enhancing lesion.

Incidence of abnormal CT findings in Simple partial seizures in the present study was around 100%, of which infarct was the commonest lesion.

A study of CT findings in patients with generalized or partial seizures in Western Rajasthan JIACM2003; 4(1);25-9 was done on 52 children with seizure disorder ;26 of them were having partial seizures while the rest were having generalized seizures. Those patients who were having known etiological factors were excluded from the study. All the patients were subjected to detailed clinical history and physical examination.CT scan was performed on every patient. Abnormal CT was found in 50% of patients with partial seizures and 34.6% of patients with generalized seizures.

In case of partial seizures most common abnormality observed was cerebral atrophy(23%) followed by calcification (11.5%),hypodense lesion(7.6%), tuberculosis, neurocysticercosis, infarction(3.8%) each. Among patients with generalized seizures the commonest finding was cerebral atrophy(15.3%) followed by cerebral edema (11.5%).

Localisation of abnormalities in cases of partial seizures is from 28% to 80% as observed in different studies.

In present study, 100% of simple partial seizures showed abnormal findings and 17.56% of generalized seizures.

In India Washimkar et al. Observed that granuloma (65.9%),neurocysticercosis(3.4) are the major causes of partial seizures.

In present study, Infarct and granuloma were the major findings in partial seizures.

Murthy et al carried out a study on 591 patients with generalized seizures, observed that 53% of them had an identifiable etiological factor. This study was conducted to determine various etiological factors of partial and generalized seizures.

A study of CT in partial motor seizures was conducted in the department of paediatrics,JIPMER between January 1995 and January 1999 consecutive children between one and twelve with simple or partial seizures associated with motor phenomenon were recruited. CT was performed on all patients. Children who had developmental delay, febrile seizures, acute intracranial infection and any other acute neurological insult were excluded from this study.

A total of 150 children with partial seizures were recruited in the study.71 of them were males and the rest females. More than two third of the children were above 6 years of age.CT was abnormal in 102 children (68%).majority of the children(75%) had single ring enhancing lesion.

The prevalence of CT scan lesion was 100 %in simple partial seizures in the present study.

A study of CT imaging in children with seizures was conducted in the Department of Paediatrics, Maulana Azad Medical College New Delhi. One hundred consecutive epileptic children aged between one year to three years during a period of one year. Cases with atleast two attacks of unprovoked seizures were included in the study. Febrile seizures and acute CNS insults were meticulously excluded. 80cases were generalized and 20 cases were partial seizures. 24% of cases showed abnormal CT scans. The lesions were atrophy (diffuse or focal), ring enhancing lesion (single or multiple), dilated ventricles, infarct, calcification, hypodensity and other structural abnormalities.

In the present study of 100 cases, 74 were generalized, 11 were partial.20% showed abnormal ct findings.Majority were infarct and granuloma

One hundred neurologically normal children aged 3 years to 12 years with partial seizures were studied prospectively in PGI Chandigarh (journal of epilepsy vol.10, issue 1 January- February 1997. The seizures were partial complex in 65% and simple partial in 35%. CT scan showed lesions in 49 patients. Neurocysticercosis (13 cases) and Granuloma (12 cases) were the two most common underlying causes.

In present study simple partial is 4% and complex partial is 7%.CT scan showed abnormality in all simple partial seizure cases and none in

complex partial. Infarct was the commonest lesion in simple partial seizure.

CONCLUSION:

- The simple partial seizure cases have high yield with around 100% abnormal findings in CT.
- In generalized seizures, focal with secondary generalization have a high yield when compared to primary generalized tonic clonic which yielded low abnormal findings.
- Other forms of seizures like absence, complex partial, and myoclonus were in the low yield group showing no abnormality in the CT brain.
- The commonest finding in the CT brain was infarct followed by granuloma.

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PROFORMA

NAME:

AGE:

SEX: 1.Male 2.Female

TYPE OF SEIZURES:

1. Primary Generalized Tonic Clonic
2. Simple Partial
3. Complex Partial
4. Focal With Secondary Generalization
5. Absence
6. Myoclonus

CT FINDINGS: 1.Normal 2. Abnormal

ABNORMALITIES DETECTED (AS PER RADIOLOGIST):

A. Granuloma
B. Infarct
C. Calcification
D. Atrophy
E. Ventricular Dilatation
F. Hypodensity

RESULTS:

1. Comparison Of Sex Wise Distribution Of Various Type Of Seizures
2. Percentage Of Abnormal CT Findings Encountered
3. Type Of Abnormalities Detected In CT

S. No	Name	Age	Sex	T.O.S	CT FINDINGS
1	Nandhini	6	F	4	**infarct**
2	manikandan	2	M	6	**N**
3	Nandhini	4	F	1	**N**
4	Divakar	4	M	1	**N**
5	Arthi	5	F	1	**granuloma**
6	Hariharan	7	M	2	**R Thalamic infarct**
7	Kaviya	9	F	1	**N**
8	mariammal	5	F	1	**N**
9	Gokul	9	M	1	**N**
10	balachandran	6	M	1	**bilateral ventricular dilatation**
11	durgadevi	7	F	1	**N**
12	laksmanan	12	M	1	**N**
13	manikandan	11	M	3	**N**
14	sathish	8	M	3	**N**
15	Regan	12	M	1	**ventricular dilatation**
16	Ragavan	4	M	3	**N**
17	Karthik	9	M	1	**N**
18	Pooja	4	F	1	**L Parietal infarct**
19	parveen raj	4	M	2	**N**
20	Aravind	12	M	1	**N**
21	Rajasekar	11	M	1	**N**
22	Pavithra	7	F	4	**N**
23	kavipriyan	11	M	5	**N**
24	veeralakshmi	10	F	4	**Infarct**
25	Rajesh	6	M	1	**N**
26	manikandan	10	M	1	**N**
27	Pooja	8	F	1	**N**
28	Ramya	5	F	3	**N**
29	muthupandi	12	M	1	**N**
30	kalpana devi	10	F	1	**Granuloma**
31	Kamali	8	F	1	**N**
32	venkatesan	8	M	1	**N**
33	sornamugesh	2	M	1	**N**
34	Alwin	10	M	1	**N**
35	Hariharan	5	M	1	**N**
36	Radhika	10	F	1	**Hypodensity L occipital region**
37	balamurugan	9	M	3	**N**
38	Padmini	5	F	4	**N**
39	Santhosh	6	M	1	**N**
40	Bala	6	M	1	**N**
41	Kanimzhi	2	F	1	**Hypodensity R occipital**

42	marimuthu	8	M	1	**N**
43	Saranya	8	F	1	**N**
44	Agasthiya	6	F	1	**N**
45	arunpandi	6	M	1	**N**
46	Abishek	2	M	3	**N**
47	Selva	11	M	1	**N**
48	aishwarya	12	F	1	**N**
49	manikandan	2	M	1	**N**
50	Gayathri	11	F	5	**N**
51	Karthik	12	M	1	**N**
52	Aravind	9	M	1	**N**
53	karuppaiah	12	M	4	**Granuloma**
54	Aravind	12	M	1	**N**
55	Rajkumar	7	M	1	**N**
56	Yogesh	3	M	5	**N**
57	Karthika	7	F	4	**L Occipital granuloma**
58	md nizam	8	M	4	**Calcification**
59	Selvi	10	M	1	**N**
60	Selvarani	4	M	1	**N**
61	jeya murli	8	M	1	**N**
62	Vinoth	4	M	1	**N**
63	Vairavan	4	F	1	**N**
64	abdul rehman	5	M	1	**N**
65	Logesh	6	M	5	**N**
66	balamurugan	3	M	1	**N**
67	Yoganand	7	F	1	**N**
68	Selvarani	11	F	1	**N**
69	Anitha	4	M	1	**N**
70	Dinesh	11	M	1	**N**
71	Barathi	5	M	1	**N**
72	manikandan	2	M	1	**N**
73	Mani	4	M	1	**I**
74	Santhosh	6	F	1	**N**
75	Bala	5	M	2	**infarct**
76	Kanimzhi	7	F	1	**N**
77	marimuthu	8	F	1	**N**
78	Saranya	3	F	1	**Infarct**
79	Agasthiya	5	M	3	**N**
80	laksmanan	4	M	1	**N**
81	manikandan	11	F	1	**Ventricular Dilatation**
82	sathish	2	F	1	**N**
83	Regan	4	M	4	**N**
84	Ragavan	5	F	1	**N**

85	Karthik	7	M	1	**N**
86	Pooja	2	F	1	**N**
87	parveen raj	8	M	1	**N**
88	Aravind	6	F	2	**granuloma**
89	Rajasekar	3	F	1	**N**
90	Pavithra	4	F	1	**N**
91	kavipriyan	5	F	1	**Ventricular Dilatation**
92	veeralakshmi	8	M	1	**N**
93	Rajesh	3	F	1	**N**
94	manikandan	2	M	1	**N**
95	Pooja	5	F	5	**N**
96	Ramya	4	M	1	**Infarct**
97	muthupandi	8	F	1	**Infarct**
98	kalpana devi	6	M	5	**N**
99	Karthik	7	M	1	**Calcification**
100	Rani	9	F	1	**N**

TOS-type of seizures

1-primary generalized tonic clonic

2-simple partial

3-complex partial

4-focal with secondary generalization

5-absence

6-myoclonus